Remarks

Claims 1-36 were pending. Claims 10, 14-16, 18-19, 22-23, 28-30 and 32-36 have been amended. As a result of this amendment, claims 1-36 remain pending. Reconsideration and reexamination are respectfully requested in view of the amendments and the following remarks.

The objection to claims 10, 14-16, 18-19, 22-23, 28-30, and 32-36 has been overcome by amending "claime d" to "claimed".

The rejection of claims 1-9, 20, 22-23, 25-26, and 34-36 under 35 U.S.C. §102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over, Riebel is respectfully traversed. Riebel discloses a fiber-reinforced protein-based biocomposite particulate material containing a legume-based thermosetting resin and cellulosic material, and rigid biocomposite pressure-formed materials produced therefrom. The particulate material and resultant pressure-formed materials contain the legume-based resin and fibrous cellulosic material in amounts such that the ratio of cellulose solids to resin solids is about 0.8:1.0 to about 1.5:1.0.

According to the last Official Action, "Riebel et al further discloses that the legume-based resin is preferably present in an amount from about 40% to about 56% (col 5, lines 37-41; col 12, lines 1-4 and 45-47). Riebel et al discloses that the secondary binder can be preferably used in an amount from about 2 to about 20% of the dry composite particles. The use of preferably and about indicate that, in some embodiments, the amount of the legume-based resin in the binder composition can be below 40% by weight of the composite and that the amount of the secondary binder can be slightly below 2% by weight of the composite without significantly affecting the results, thus embodiments wherein the total resin composition can be less than 40% by weight of the composite are envisioned."

Contrary to the position stated in the Official Action, Riebel does not contemplate compositions in which the total resin content is less than 40% by weight of the composite. The impact of the ratio of paper to soy resin was evaluated in Example 4. Col. 30, line 31 to col. 31, line 39. Three ratios of paper to soy resin were tested: 0.8:1.0, 1.3:1.0, and 1.5:1.0.

The 1.5:1 ratio had significantly ($P<0.05$) higher two hour and twenty-four hour edge swell values than the other two combinations. The high amount of fiber present in this ratio did not receive adequate coating by the soy resin. Therefore, there was

> insufficient internal bond strength of the composite panel to prevent it from swelling considerably when submerged in water. There was no significant ($P<0.05$) difference between the two lower ratios used in this study.
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> This example shows that the ratio of paper to soy resin solids is important in the production of the panels according to the present invention. If the amount of paper is too low, the panels produced do not have sufficient strength and stiffness. If the amount of paper is too high, the panels do not have sufficient water resistance.

Col. 31, lines 25-39.

Thus, Riebel teaches away from using a ratio of more than 1.5:1.0 because of the reduced water resistance.

The high and low ratios tested in Example 4 are the outer limits for the ratio of paper to soy resin discussed in col. 5, lines 30-41.

> This protein-based resin (also referred to as a legume-based resin) forms the matrix, i.e., the primary binding agent, of the biocomposite material of the present invention, whether in the form of particulate material or pressure-formed material. Preferably, on a dry weight basis, the ratio of cellulose to resin solids, e.g., paper to soy flour, is about *0.8:1.0 to about 1.5:1.0*, and more preferably about 1.0:1.0 to about 1.3:1.0. Thus, the amount of the thermosetting resin solids relative to the total amount of resin solids and cellulose solids in the particulate material prior to pressure-forming is preferably about 40-56%, and more preferably about 43-50%.

The conversion of the ratios provides the weight percentages cited (0.8:1.0 = 56%; 1.5:1.0 = 40%; 1.0:1.0 = 50%; and 1.3:1.0 = 43%).

The Official Action also stated that "[a]lthough the preferred amount of binder is greater than 40%, the use of "preferably" indicates that, in some embodiments, the amount of the legume-based resin the binder composition can be below 40% by weight of the composite and that the amount of the secondary binder can be below 2% by weight of the composite without significantly affecting the results." However, as discussed above, Riebel specifically teaches that less than 40% resin binder should not be used because of the reduced water resistance.

The Offical Action further stated that "the use of 'about' indicates that the preferred lower limits can be less than 40% for the legume-based resin and less than 2% for the secondary

synthetic resin. For example, 36% could be considered about 40% and 1.5% could be considered about 2%." The Official Action is correct that, in some circumstances, 36% could be considered "about 40%." However, Riebel has limited the range of about in this case. First, as discussed above, Riebel specifically teaches that there should not be less than 40% resin because the water resistance problem.

In contrast, Applicants can successfully use less than 40% resin. For instance, in Example 10, paragraphs [0091-0094], the total binder used is 3-4% and the thickness swell is 18.7-25.3%.

Moreover, Riebel teaches that the particles are "fully impregnated with resin such individual fibers of the paper are resin coated (or more appropriately, fused with resin). That is, a new composite material is prepared rather that a material that is produced by simply gluing together paper pieces by an adhesive through contact bonding." Col. 5, lines 45-48. See also, paragraph [0005] of Applicant's specification. In contrast, in the claimed invention, the amount of resin binder included in the composite should not "be sufficient so that it fully impregnates the cellulosic material." Paragraph [0032].

Furthermore, each of the ratios Riebel uses has one significant digit after the decimal point (0.8:1.0, 1.0:1.0, 1.3:1.0, and 1.5:1.0). This means that a ratio of 1.4:1.0 must be different from either a ratio of 1.3:1.0 or a ratio of 1.5:1.0. A ratio of 1.4:1.0 corresponds to 42%, which means that "about 40%" must be equal to or less than one half the difference between 40 and 42%, or 1%. Reducing 40% by this amount gives an interim figure of 39%. When the at least 1.5% secondary resin is added to 39%, the total resin content is at least 40.5%, and outside the claimed range of less than 40%.

At worst, Riebel's use of ratios for the lower limit of 1.5:1.0 (corresponding to 40%) and 1.3:1.0 (corresponding to 43%) indicates that these two ratios are different. Therefore, the limit on the range must be less than half of the difference between 40% and 43%. This means that "about 40%" must be more than 38.5%, which when added to the at least 1.5% secondary resin gives a total of at least 40%, which is again outside the claimed range of less than 40%.

Therefore, claims 1-9, 20, 22-23, 25-26, and 34-36 are not anticipated by, nor would they have been obvious to one having ordinary skill in the art at the time the invention was made over, Riebel.

The rejection of claims 10-13 and 28-31 under 35 U.S.C. §103(a) as being unpatentable over Riebel in view of Clay and Hse is respectfully traversed. Clay and Hse are cited as teaching soy hydrolysates and phenolic resins as binders. However, Clay and Hse do not remedy the deficiencies of Riebel. Therefore, claims 10-13 and 28-31 would not have been obvious to one of ordinary skill in the art at the time of the invention over Riebel in view of Clay and Hse.

The rejection of claims 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over Riebel in view of Holmberg is respectfully traversed. Holmberg is cited as teaching "a binder composition comprising phenol formaldehyde that can be used with cellulosic material, such as wood chips" and that "the aldehyde can be either formaldehyde or paraformaldehyde." Holmberg does not remedy the deficiencies of Riebel. Therefore, claims 14 and 15 would not have been obvious to one of ordinary skill in the art at the time of the invention over Riebel in view of Holmberg.

The rejection of claims 16-19 under 35 U.S.C. §103(a) as being unpatentable over Riebel in view of Hse and further in view of Wynstra is respectfully traversed. Hse is cited as teaching "an OSB panel having an adhesive comprising a soy protein hydrozylate, caustic, formaldehyde, and phenol. The molar ratio of formaldehyde to phenol to caustic is 1.65:1:0.65, which is similar to the disclosed composition." Wynstra is cited as teaching "a thermosetting resin composition comprising a fibrous material, phenol, formaldehyde and a base catalyst," and that "under alkaline conditions, phenol and formaldehyde condense to form methylols." Neither Hse nor Wynstra remedy the deficiencies of Riebel. Therefore, claims 16-19 would not have been obvious to one of ordinary skill in the art at the time of the invention over Riebel in view of Hse and further in view of Wynstra.

The rejection of claim 21 under 35 U.S.C. §103(a) as being unpatentable over Riebel in view of Blizzard is respectfully traversed. Blizzard is cited as teaching "a silicone coating composition useful for coating a substrate to provide a water resistant coating." Blizzard does not remedy the deficiencies of Riebel. Therefore, claim 21 would not have been obvious to one of ordinary skill in the art at the time of the invention over Riebel in view of Blizzard.

The rejection of claim 24 under 35 U.S.C. §103(a) as being unpatentable over Riebel in view of Roubicek has been overcome. Roubicek is cited as teaching that "felting is a standard process used to produce hardboard." Roubicek does not remedy the deficiencies of Riebel.

Therefore, claim 24 would not have been obvious to one of ordinary skill in the art at the time of the invention over Riebel in view of Roubicek.

The rejection of claims 27 and 32-33 under 35 U.S.C. §103(a) as being unpatentable over Riebel in view of Johns has been overcome. Johns is cited as teaching that "a commercially popular resin for use in making particle boards is polymeric isocyanate." Johns is also cited as teaching that "phenolic resins, although inexpensive, have a slow cure and require resin in excess of that normally necessary to overcome the swelling tendency of cellulose when exposed to moisture and caustic," and that "[i]socyanate resins are fast curing and can be used at approximately half the rate of application of phenolic resins to achieve the same strength, but are expensive." Johns does not remedy the deficiencies of Riebel. Therefore, claims 27 and 32-33 would not have been obvious to one of ordinary skill in the art at the time of the invention over Riebel in view of Johns.

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The examiner also stated that "[a]lthough the preferred amount of binder is greater than 40%, the use of "preferably" indicates that, in some embodiments, the amount of the legume-based resin the binder composition can be below 40% by weight of the composite and that the amount of the secondary binder can be below 2% by weight of the composite without significantly affecting the results." However, as discussed above, Reibel specifically teaches that less than 40% resin binder should not be used because of the reduced water resistance.

The examiner further stated that "the use of 'about' indicates that the preferred lower limits can be less than 40% for the legume-based resin and less than 2% for the secondary synthetic resin. For example, 36% could be considered about 40% and 1.5% could be considered

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